

**REMARKS**

Claims 1-42 are presently pending in the application. The even-numbered claims between 2 and 42 remain withdrawn from consideration.

Claim 1 has been amended to recite that the thermal fuse element is divided by surface tension, which is supported in the present application at least in paragraph [0020]. No new matter has been added by this amendment, and entry is respectfully requested.

Applicant acknowledges and appreciates the Examiner's indication in the present Office Action that claims 7, 9, 11, 13, 15, 17, 19, 21, 27, 29, 31, 33, 35, 37, 39 and 41 have only been objected to as depending on a rejected base claim. The Examiner acknowledges that the claimed elements are not taught or suggested by the prior art.

However, the Examiner has rejected claims 1, 3, and 5 under 35 U.S.C. § 103(a) as being unpatentable over JP 59-8231 ("JP '231") in view of JP 2000-141079 ("JP '079"). The Examiner has also rejected claims 23 and 25 under 35 U.S.C. § 103(a) as being unpatentable over JP '231 in view of JP '079 and further in view of U.S. Patent No. 1,214,879 of Baruch ("Baruch"). Applicant respectfully traverses these rejections and the arguments in support thereof as follows, and respectfully requests reconsideration and withdrawal of the rejections.

*Rejection Under § 103(a) Based on JP '231 in view of JP '079*

Regarding claims 1, 3, and 5, the Examiner argues that JP '231 discloses in Figs. 1-4 a thermal fuse having a fuse element made of an alloy composition material comprising Bi and Sn (page 2, Table 1, line 1), but acknowledges that the claimed ranges for Bi and Sn are not disclosed. However, JP '079 allegedly teaches a Sn-Bi alloy having 25-55 wt% Bi and 45-75 wt% Sn, in which the alloy has improved ductility and low manufacturing cost. Therefore, the Examiner concludes that it would have been obvious to one having ordinary skill in the art at the time of the invention to use the alloy of JP '079 for the fuse element of JP '231 in order to provide the fuse element with enhanced ductility, subsequently reducing manufacturing cost. Further, since the ranges of Sn and Bi in the proposed combination would allegedly overlap the claimed ranges, the Examiner contends that it would also have been obvious to select the claimed ranges for the Sn-Bi alloy. Applicant respectfully traverses this rejection as follows.

Initially, Applicant traverses the Examiner's understanding of JP '231, and in particular his statement that a thermal fuse of JP '231 discloses a fuse element made of a Bi-Sn alloy as claimed. Rather, the alloy of the fuse element shown in Figs. 1-4 is a Sn-Pb-In alloy, recited in claim 1 of JP '231 and described in col. 2. The thermal fuse element of the thermal fuse shown in Figs. 1-4 of JP '231 is a thermal fuse element which is divided by surface tension, or a surface tension action type-thermal fuse element (see the description below Table 1 in JP '231, col. 2), as in the present invention. However, this thermal fuse element which is divided by surface tension contains a Sn-Pb-In alloy, not the claimed Bi-Sn alloy.

Applicant does not disagree that in Table 1 of JP '231, a Bi-Sn alloy is described. However, this Bi-Sn alloy is for an elastic force action type-thermal fuse element, which uses a spring plate or a spring, and is not for a thermal fuse element divided by surface tension. Thus, JP '231 does not teach that a Bi-Sn alloy is used as a surface tension action type-thermal fuse element (a thermal fuse element which is divided by surface tension) as in the present invention.

Further, JP '079 does not cure the deficiencies with JP '231. Rather, JP '079 only discloses that a Bi-Sn alloy is used as a solder which has soldability and mechanical strength comparable to that of a Sn-Bi eutectic solder. Solders and thermal fuses are functionally completely different from one another as follows.

In a thermal fuse, after right and left lead conductors are connected to each other by the thermal fuse element, the thermal fuse element must melt again at a predetermined operating temperature to cut off the current. In contrast, when, for example, an electrode is connected to an electronic component by a solder, the connected solder should not melt again, regardless of the temperature, and must insure that the current flows continuously and is not cut off. Thus, a thermal fuse is completely different from a solder in terms of required functions and features and the teaching of a solder in JP '079 is not relevant to the present invention.

Further, one skilled in the art of thermal fuses would not be motivated to look to a solder for a possible alloy for use in the fuse element. More specifically, in order to arrive at the present invention, one would have to substitute the Bi-Sn solder of JP '079 for the Sn-Pb-In alloy in the surface tension action type-thermal fuse of JP '231 (having a fuse element which is divided by surface tension), and there would be no motivation to make such a substitution nor

any reasonable expectation of success in such a replacement. Accordingly, no *prima facie* case of obviousness has been established based on the proposed combination of JP '231 and JP '079.

Applicant has discovered that by utilizing the claimed alloy composition, it is possible to limit the dispersion of the operating temperature of the thermal fuse to  $\pm 3^{\circ}\text{C}$  - the thermal fuse element will necessarily melt again in this narrow temperature range. Such results would not be expected based on the proposed combination of JP '231 and JP '079, since JP '231 does not teach the claimed type of thermal fuses containing a Bi-Sn alloy, and JP '079 does not teach any type of alloy.

In conclusion, since the proposed combination of JP '231 and JP '079 does not teach a Bi-Sn alloy which is used in a thermal fuse element which is divided by surface tension as claimed, reconsideration and withdrawal of the § 103(a) rejection are respectfully requested.

*Rejection Under § 103(a) Based on JP '231 in view of JP '079 and Baruch*

Regarding claims 23 and 25, the Examiner acknowledges that the proposed combination of JP '231 and JP '079 fails to teach a heating element. However, Baruch allegedly teaches a fuse comprising a fusible member (4) surrounded by a heating element (6) for the purpose of decreasing response time of the fuse during low current overload conditions (col. 3, lines 1+). Therefore, the Examiner concludes that it would have been obvious to one having ordinary skill in the art at the time of the invention to provide the combination of JP '231 and JP '079 with the heating element of Baruch in order to enhance the responsiveness of the fuse during low current overload conditions. Applicant respectfully traverses this rejection as follows.

As previously explained, even the proposed combination of JP '231 and JP '079 does not teach or suggest all of the claimed elements, including a thermal fuse element divided by surface tension containing the claimed Sn-Bi alloy, and Baruch does not cure these deficiencies. Rather, Baruch is only cited as teaching a heating element in a fuse and does not teach or suggest a thermal fuse element divided by surface tension, an alloy type thermal fuse, or a Sn-Bi alloy. Thus, even the proposed combination of JP '231, JP '079 and Baruch would not teach or suggest all of the claimed elements. Accordingly, reconsideration and withdrawal of the § 103(a) rejection are respectfully requested.

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In view of the preceding Amendments and Remarks, it is respectfully submitted that all of the pending claims are patentably distinct from the prior art of record and in condition for allowance. A Notice of Allowance is respectfully requested.

Respectfully submitted,

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